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Original Article

Effect of hope therapy on fertility stress and pregnancy rate in infertile patients undergoing intrauterine insemination

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Abstract: Objective: To investigate the efficacy of hope therapy on fertility stress and pregnancy rate in infertile patients undergoing intrauterine insemination (IUI). Methods: In this retrospective study, 180 infertile patients undergoing IUI during May 2017 and October 2019 were enrolled and grouped into a study group (n=90) receiving hope therapy and control group (n=90) receiving routine infertility care. The two groups were compared in terms of anxiety and depression, scores of Fertility Problem Inventory (FPI), scores of coping style, social support before and after intervention, and post-intervention hormone levels. Results: (1) Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HAMD) scores showed no significant difference in both groups before intervention (P>0.05). After intervention, the study group exhibited lower scores of HAMA and HAMD than the control group (P<0.05). (2) The two groups showed no significant difference in FPI scale scores before intervention (P>0.05). After intervention, the study group exhibited lower scores of FPI than the control group (P<0.05). (3) The two groups had no significant difference in negative coping and positive coping scores before intervention (P>0.05). After intervention, the study group had lower negative coping scores and higher positive coping scores than the control group (P<0.05). (4) After intervention, the study group showed lower scores of obsessive-compulsive, interpersonal sensibility, depression, and anxiety, and significantly higher proportion of patients with SCL-90 positive factors regarding depression and anxiety than the control group (P<0.05). (5) The study group showed higher serum levels of luteinizing hormone (LH) and follicle stimulating hormone (FSH) than the control group after intervention (P<0.05). (6) The study group had a higher pregnancy rate than the control group at 6 months' follow-up (P<0.05). Conclusion: Hope therapy for infertile patients undergoing IUI can help improve their adverse mood, improve their fertility attitude, and improve pregnancy rate while decreasing the scores of depression, anxiety, and obsessive-compulsive factors.

Keywords: Hope therapy, infertility, intrauterine insemination, fertility stress, pregnancy rate

Introduction

Infertility is clinically defined as inability to get pregnant (conceive) after 1 year of frequent, unprotected sex, or after 6 months if the woman is over 35 years of age [1], and is mainly divided into primary infertility and secondary infertility. With the comprehensive opening of the two-child policy in China, the fertility desire of residents has gradually increased, but the incidence of infertility has been increasing in recent years due to environmental, social, and dietary factors [2, 3]. Data show that the incidence of infertility among couples of childbearing age in developed countries is about 15%, while the incidence in China has been as high as 25% and is still showing an increasing trend. At present, infertility, along with tumor and cardiovascular disease, is among the three major diseases affecting human life and health [4, 5].

Intrauterine insemination (IUI) refers to the method of injecting the treated sperm suspension directly into the uterine cavity by relying on a catheter [6], which is the most widely used clinical method of IUI with the highest success rate at present. It has been pointed out in a previous study that IUI has the advantages of a simple operation, high repeatability and low price compared with *in vitro* fertilization-embryo

transfer (IVF-ET) [7]. It has also been reported that IUI technique is superior to IVF-ET technique in singleton pregnancy outcomes, so IUI has become one of the most commonly used adjuvant treatments for infertile women [8].

However, with the clinical promotion of IUI, most scholars have found that the success rate of IUI is always around 10%-20%, and this is difficult to improve. Women need to increase the number of treatments to improve the cumulative pregnancy rate [9]. It was previously believed that the low success rate of IUI was related to the level of skill of the performer, but in recent years, some scholars proposed that this phenomenon might be influenced by psychological factors [10]. Previous research on patients receiving IUI treatment has shown that about 65% of patients experience significant anxiety and about 17% of patients experience depression; there are also patients with psychological problems such as marital and sexual disharmony [11]. A questionnaire survey for patients treated by IUI showed that the score of anxiety factors (1.40±0.32) in SCL-90 scale for patients with IUI was significantly lower than the national norm (1.50±0.43), and depression factors (1.40±0.36) were also lower than the national norm (1.50±0.59) [12].

Hope therapy is an intervention based on Snyder's hope theory, which is one of the positive psychotherapies. This intervention mainly improves the patient's hope level through the three steps of hope infusion, goal setting, and strengthening the patient's path of motivational thinking, thus improving the patient's sense of happiness and meaning, eliminating the patient's negative emotions including depression and anxiety, and finally enabling the patient to face the future with a positive and rational attitude.

This study was designed to investigate the fertility stress and pregnancy rate of IUI patients after receiving hope therapy. It was planned to conduct a comparative analysis to demonstrate the feasibility of its application, in which the expected goal was that hope therapy could significantly improve the fertility stress and pregnancy rate of infertility patients undergoing IUI treatment, thus having a certain influence on the effect of clinical intervention. The study may provide a certain clinical reference for improving the treatment status of patients undergoing IUI and provide more detailed data for clinical intervention for patients with IUI.

Materials and methods

General data

In this retrospective study, 180 infertile patients who underwent IUI in our hospital from May 2017 to October 2019 were selected as the research subjects, and they were divided into a study group (n=90, receiving hope therapy intervention) and a control group (n=90, receiving routine infertility care) according to intervention method.

Inclusion criteria: (1) patients aged 20-40 years old; (2) patients who met the diagnostic criteria for infertility and underwent IUI treatment [13]; (3) patients with complete clinical data. The study was carried out with the approval of the ethics committee of the First Affiliated Hospital of Hainan Medical University. This is a retrospective study, and the requirement for informed consent was therefore waived.

Exclusion criteria: (1) those who also had psychiatric disorders who had recently experienced major traumatic events in life; (2) those with contraindications to IUI treatment, such as urinary tract infections, sexually transmitted diseases, acute inflammation, or cognitive and communication impairments; (3) those with drug or alcohol abuse; (4) those with serious hypoplasia or malformation of reproductive organs or amenorrhea infertility due to uterine, cervical, tubal or immune factors; and (5) those with complete oviduct occlusion combined severe liver and kidney dysfunction; (6) those complicated with malignant tumors; and (7) those complicated with serious organic disorder.

Intervention methods

Patients in both groups received the same routine care measures, such as ovulation monitoring and appropriate selection of insemination timing. The following measures were also taken in the control group: (1) Individual psy-

chological assessment. In view of the fact that patients with IUI were prone to anxiety and depression according to the preliminary investigation, the psychological state of patients was assessed on a scale before treatment to understand the level of their mental health; for patients with obvious anxiety and depression, playing light music and creating a warm atmosphere was adopted to relieve their emotions. (2) Health education. The focus was to enable patients to understand the causes of infertility, common manifestations. and treatment measures. At the same time, the treatment principles of IUI and common adverse reactions were explained to prevent panic, fear and other emotions, improve the treatment confidence of patients, and counteract expectations of treatment failure.

The study group received hope therapy in addition to the above interventions: (1) Hope infusion. Patients with IUI may have obvious concerns, anxiety, or even fear of treatment due to infertility, clinical treatment, repeated examinations, and other factors. Nursing staff introduced successful cases, psychological counseling, and group intervention to build confidence in treatment and their treatment compliance. (2) Improving social support. Psychological support from family and society should be given to patients. For family support, the patient's family or parents should be mobilized to give the patient adequate company or communication. For social support, medical workers should provide psychological education to patients, informing them of the high success rate of IUI treatment and that the overall success rate is still high even if the single treatment is unsuccessful, so as to improve the treatment compliance and treatment confidence of patients.

Outcome measurement

Primary indicators

Fertility stress: Fertility Problem Inventory (FPI) [14] was used to evaluate the fertility stress scores before and after intervention. The FPI scale consists of 46 items, including five dimensions of social concern, sexual concern, relationship concern, need for parenthood, and childless lifestyle, with total scores ranging from 46 to 276, with higher score representing greater stress.

Pregnancy rate: Both groups were followed up for 6 months. Follow-up was done by subsequent visits and telephone. The pregnancy rates were recorded and compared.

Coping styles: The coping styles of the two groups were assessed at 15 d, 1 month, 2 months, and 3 months of the intervention. The scale was divided into two dimensions: positive coping and negative coping, with a total of 20 items on a 0-3 scale, with a total score of 60 points. A higher positive coping score indicates a more positive attitude of the subjects, and a higher negative coping score indicates a more negative attitude [15].

Secondary indicators

Anxiety and depression: Anxiety and depression were assessed in both groups before and 3 months after intervention. The anxiety was assessed using Hamilton Anxiety Scale (HAMA) [16], which consists of 14 items on a 0-4 scale, ranging 0-56 points, with a score of 29 and above representing severe anxiety, 21-28 representing significant anxiety, 14-20 representing the presence of anxiety, 7-13 representing possible anxiety, and 6 and below representing no anxiety. The depression was assessed using Hamilton Depression Scale (HAMD), which consists of 17 items, with a score of 36 and above representing severe depression, 20-35 representing the presence of depression, 8-19 representing possible depression, and 8 and below representing no depression.

Social support: The SCL-90 scale [17] was used to assess the social support of the two groups of patients, which consists of 90 items on a five-point Likert scale, including nine factors such as somatization, obsessive-compulsive factors, and interpersonal relationships, with higher scores representing more serious symptoms.

Luteinizing hormone (LH) and follicle stimulating hormone (FSH): Blood samples were extracted from patents of both groups before and after intervention, and the serum was

Table 1. Comparison of general clinical indicators between the two groups (mean ± SD)/[n (%)]

General data	Study group (n=90)	Control group (n=90)	t/X^2	*P*
Mean age (years old)	37.98±3.29	38.11±3.49	0.257	0.797
Mean male age (years old)	39.49±4.39	40.01±3.48	0.881	0.379
Mean weight (kg)	63.29±3.29	63.11±3.49	0.356	0.722
Mean BMI (kg/m^2)	21.89±3.22	21.94±2.98	0.108	0.914
Mean duration of infertility (years)	1.89±0.43	1.79±0.54	1.374	0.171

Table 2. Comparison of HAMA and HAMD scores between two groups before and after intervention (mean ± SD)

Group	Number of cases	HAMA		HAMD	
		Before intervention	After intervention	Before intervention	After intervention
Study group	90	19.29±2.21	9.22±1.23	15.11±1.23	5.18±1.22
Control group	90	19.31±2.08	13.29±1.21	15.09±1.34	7.11±1.09
t	-	0.063	22.378	0.104	11.192
P	-	0.95	<0.001	0.917	<0.001

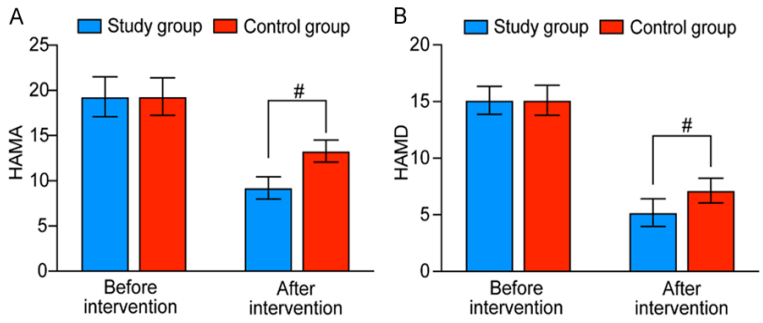

Figure 1. Comparison of anxiety and depression scores. A: HAMA; B: HAMD. Compared to the control group, #*P*<0.05. The t-test was used for analysis.

reserved for use after centrifugation. The levels of LH and FSH were measured by enzyme linked immunosorbent assay, and the changes in LH and FSH levels before and after intervention were analyzed.

Statistical analysis

SPSS22.0 statistical software was selected to analyze the data collected in the study. The measured data were expressed by means ± standard deviation (SD), and the normal distribution and the homogeneity of variance test were conducted. T-test was applied to data that met a normal distribution or homogeneity of variance, such as adverse mood and fertility stress before and after intervention, and the Mann-Whitney U test or non-parametric test was used for statistical inferences for data of heterogeneity of variance. Chi-square test was used for counted data such as gender differences between groups. *P*<0.05 was defined as a significant difference. In this study, GraphPad Prism 8.3 was applied for plotting.

Results

Comparison of baseline data

The two groups had no significant difference in baseline data including mean age, mean weight, mean body mass index (BMI), and course of disease (*P*>0.05) (**Table 1**).

Analysis of anxiety and depression before and after treatment

After intervention, the HAMA and HAMD scores of both groups were lower than those before intervention, and the study group showed lower scores than the control group (*P*<0.05) (**Table 2**; **Figure 1**).

Comparison of FPI scale scores before and after intervention

No significant difference was found in the scores of FPI between the two groups before intervention (*P*>0.05). After intervention, the

Table 3. Comparison of fertility stress scale scores between two groups before and after intervention (mean ± SD)

Group	n		Social concerns	Sexual concerns	Relationship concerns	Need for parenthood	Childless lifestyle
Study group	90	Before intervention	33.29±2.30	21.98±3.20	37.44±3.39	39.87±6.55	28.98±3.40
		After intervention	27.69±2.39*,#	15.28±2.39*,#	28.22±3.20*,#	27.29±4.93*,#	19.29±3.22*,#
Control group	90	Before intervention	33.19±2.89	22.01±3.19	37.54±3.19	39.98±6.19	29.11±3.29
		After intervention	30.19±3.01*	17.29±3.20*	31.29±4.40*	32.29±3.49*	23.11±2.30*

Note: compared to before intervention. *P<0.05; compared to the control group, #P<0.05.

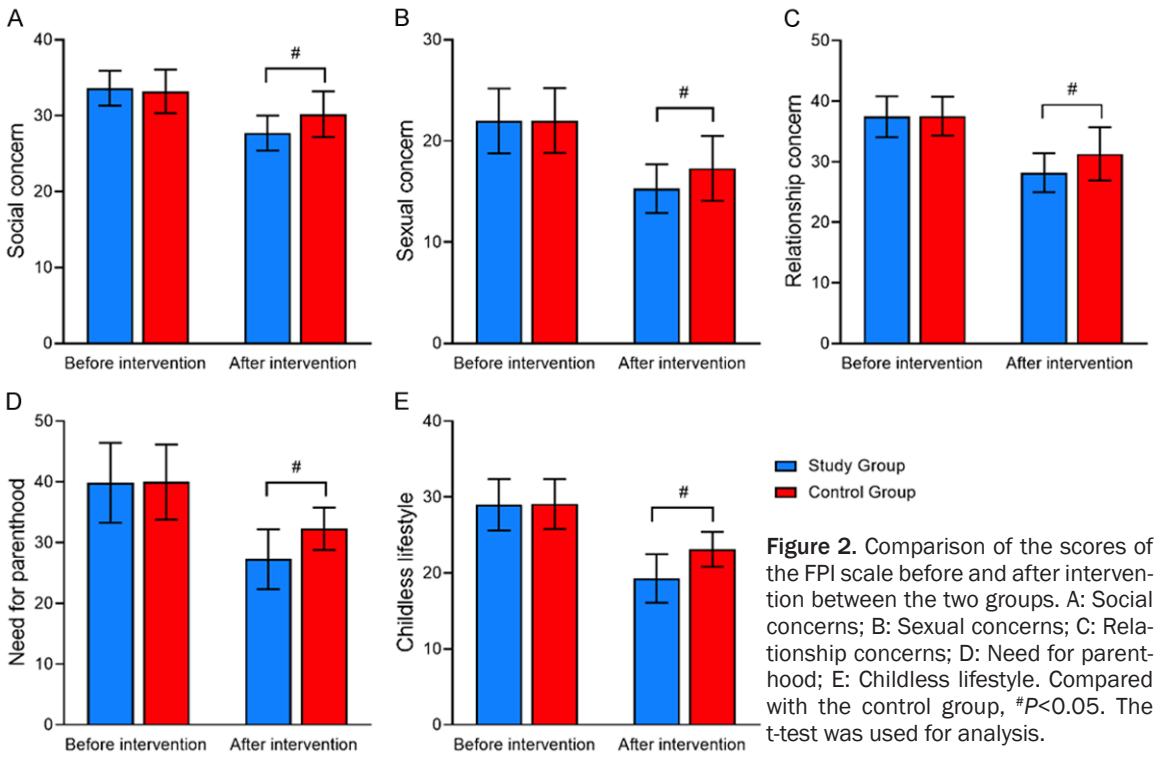

Figure 2. Comparison of the scores of the FPI scale before and after intervention between the two groups. A: Social concerns; B: Sexual concerns; C: Relationship concerns; D: Need for parenthood; E: Childless lifestyle. Compared with the control group, #P<0.05. The t-test was used for analysis.

Table 4. Comparison of the scores of coping styles between the two groups (mean ± SD)

Indicator	Group	n	15 d of intervention	1 month of intervention	2 months of intervention	3 months of intervention
Negative response	Study group	90	2.34±0.21	2.11±0.19*,#	1.87±0.09*,#	1.61±0.08*,#
	Control group	90	2.41±0.19	2.27±0.12*	1.93±0.04*	1.71±0.09*
Positive response	Study group	90	1.41±0.21	1.53±0.14*,#	1.87±0.21*,#	1.99±0.18*,#
	Control group	90	1.40±0.19	1.42±0.09	1.52±0.11*	1.71±0.20*

Note: compared to before intervention, *P<0.05; compared to the control group, #P<0.05.

study group had lower scores of FPI dimensions than the control group (P<0.05) (**Table 3**; **Figure 2**).

Comparison of coping styles scores between the two groups

At 1, 2 and 3 months of intervention, the study group had significantly lower negative coping scores and higher positive coping scores than the control group (P<0.05) (**Table 4**; **Figure 3**).

Comparison of social support scale scores between the two groups

No significant difference was observed in SCL-90 scale between the two groups before intervention (P>0.05). After 3 months of interven-

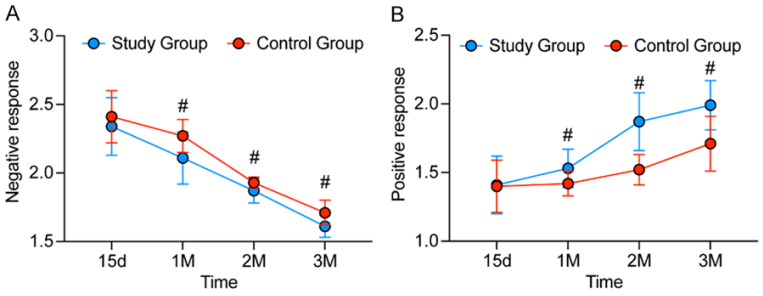

Figure 3. Comparison of scores of coping styles. A: Negative coping scores; B: Positive coping scores. Compared to the control group, $^{\#}P<0.05$. The t-test was used for analysis.

Table 5. Comparison of the SCL-90 scale scores between the two groups (mean ± SD)

Dimension	Study group (n=90)	Control group (n=90)	*t*	*P*
Somatization	1.35±0.23	1.41±0.29	1.538	0.126
Obsessive-compulsive factors	1.51±0.19	1.69±0.21	6.030	<0.001
Interpersonal relationships	1.48±0.21	1.71±0.19	7.705	<0.001
Depression	1.51±0.19	1.61±0.23	3.180	<0.001
Anxiety	1.50±0.20	1.63±0.19	4.471	<0.001
Hostility	1.44±0.19	1.45±0.20	0.353	0.724
Terror	1.21±0.09	1.26±0.10	1.921	0.056
Paranoid ideation	1.31±0.23	1.38±0.32	1.685	0.094
Psychoticism	1.35±0.29	1.36±0.30	0.227	0.820

tion, the study group exhibited significantly lower scores of four dimensions of the SCL-90 scale: namely, obsessive-compulsive factors, interpersonal relationships, depression, and anxiety, than the control group (all $P<0.05$), whereas there was no significant difference in other factors, such as somatization, hostility, paranoid ideation, and psychoticism, between the two groups (all $P>0.05$). The study group had a higher percentage of patients with SCL-90 positive factors regarding depression and anxiety than the control group ($P<0.05$), indicating that hope therapy improved patients' anxiety and depression as well as regulating patients' stress (**Tables 5** and **6**).

Comparison of hormone levels and pregnancy rates before and after intervention

The difference in LH and FSH levels between the two groups before intervention showed no significance (both $P>0.05$), while the levels of the above hormones were increased in both groups after intervention (both $P<0.05$). The study group showed higher LH and FSH levels than the control group after intervention ($P<0.05$) (**Table 7**). The pregnancy rate of the study group was 44.44% and that of the control group was 22.22% after 6 months of follow-up, ($P<0.05$).

Discussion

The rapid development of assisted reproductive technology in recent years has made intrauterine insemination (IUI) one of the most common procedures in many hospitals in China [18]. IUI is mainly a process in which the treated semen is injected into the female uterine cavity for insemination by relying on a catheter after the sperm washing process [19]. IUI is relatively simple in operation and principle, and the treatment cost is low, making it an effective assisted reproductive technology. However, after its promotion and application, many scholars found that the success rate of IUI is low, and this low effectiveness of the technique also has a certain impact on the mood of infertile women. Recent studies suggest that psychological factors may play a role in the success rate of IUI. For example, some scholars have found that women who received IUI often had anxiety and depression, and a questionnaire survey showed that such women are often under great social and family pressure, coupled with a lack of understanding of IUI, resulting in a high incidence of psychological problems [20]. It has also been pointed out that the success rate of IUI is low, and thus women who undergo IUI may experience significant anxiety and depression after repeated unsuccessful treatments, and even have resistance to treatment, which in turn may further worsen IUI's effectiveness [21]. Therefore, medical workers should make more effort to improve the adverse mood of women treated with IUI.

The above research results provide a theoretical basis for the development of this study. This

Table 6. Comparison of proportion of SCL-90 positive factors between the two groups [n (%)]

Group	Number of cases	Hostility	Obsessive-compulsive factors	Interpersonal relationships	Depression	Anxiety
Study group	90	9 (10.00)	11 (12.22)	8 (8.89)	14 (15.56)	15 (16.67)
Control group	90	6 (6.67)	7 (7.78)	5 (5.56)	2 (2.22)	2 (2.22)
X^2	-	0.655	0.988	0.746	9.878	10.978
P	-	0.418	0.32	0.388	0.002	0.001

Table 7. Comparison of hormone levels (mean ± SD, mIU/mL)

Group	Number of cases	LH		FSH	
		Before intervention	After intervention	Before intervention	After intervention
Study group	90	10.21±2.11	14.39±2.11#	6.23±0.33	8.98±0.45#
Control group	90	10.34±1.98	12.31±1.78#	6.29±0.29	7.11±0.39#
t	-	0.426	7.148	1.296	29.792
P	-	0.671	<0.001	0.197	<0.001

Note: Comparison to before intervention, #*P*<0.05.

study explored the changes in fertility stress and pregnancy rate of patients with IUI after hope therapy intervention. The results showed that the study group exhibited lower HAMD scores than the control group after intervention. It has been reported that psychological intervention significantly increased patients' knowledge of treatment (80.00% vs. 37.50%) and improved clinical pregnancy rates (20.00% vs. 15.00%). Researchers concluded that psychological intervention could alleviate mental stress during the IUI treatment and had positive implications to improve treatment outcome [22]. Compared with the result above, the data in this study revealed that the pregnancy rate of patients receiving intervention increased from 22.22% to 44.44%, and the effect was stronger than that seen by previous scholars. The authors of this study believe that the reason may be due to the relatively small sample size in the study. Other possible reasons: the hope therapy used in the study is a form of psychological intervention therapy, which has a relatively smaller coverage compared to the psychological intervention of the above-mentioned scholars, thus leading to a gap in the effectivenessimproving patients' mood. However, the psychological state of patients was evaluated before the implementation of this study, which provides a more accurate direction for the implementation of follow-up hope therapy, thus providing better support for improving the therapeutic effect.

This study also analyzed the effect of hope therapy on the fertility stress and coping styles of patients with IUI treatment. The results showed that the study group had significantly lower scores of FPI dimensions than the control group after intervention. It has been found that one of the main reasons for the high incidence of anxiety and depression in patients undergoing IUI treatment is great fertility stress, and the psychological burden of infertile women is more obvious than that of men under the influence of traditional Chinese thought [23]. The scores of FPI dimensions in the study group were decreased significantly after intervention, indicating a significant increase in women's acceptance level of IUI treatment and change in their attitudes towards infertility. That is, they were more likely to accept the fact that they were infertile and adjust the psychological expectations of treatment outcome [24]. This study also compared the changes in the scores of social support scale between the two groups after intervention, and the results showed that the scores of the four dimensions of obsessive-compulsive factors, interpersonal relationships, depression, and anxiety in the study group were significantly lower than those of the control group. The reason may be that hope therapy, on the one hand, can instill hope in patients, enabling them to calmly accept the treatment results and actively cooperate with the follow-up intervention; on the other hand, hope therapy can also determine the treatment goal, strengthen

the thought process of patients, strengthen the role of patients' family members in the treatment, and thus provide psychological support for patients from multiple perspectives [25]. This is evidenced by the SCL-90 scale scores of the two groups of patients. Finally, the effect of hope therapy on the hormone levels and pregnancy rates of infertile patients was also analyzed. The findings revealed that the study group showed significantly higher LH and FSH levels than the control group after intervention, and exhibited a higher pregnancy rate than the control group after 6 months' follow-up, which indicated that hope therapy could also affect the hormone levels of infertile patients. The reason may be that alleviation of patients' bad moods may affect their endocrine secretion, but the specific mechanism needs further research.

In conclusion, hope therapy can improve the adverse emotions, improve the level of coping with fertility stress and positive coping attitudes, and have a positive impact on depression, anxiety and obsessive-compulsive scores in infertile patients undergoing IUI. The innovation of this study is that by setting up a controlled study, the low treatment success rate of IUI patients was taken as a starting point to preliminarily analyze the feasibility of hope therapy in improving the success rate of IUI treatment from the perspective of psychological support. This study also has some deficiencies. On the one hand, data analysis and quantitative analysis were mainly conducted without trying to explain the reasons for the low success rate of IUI from the physiological perspective. On the other hand, in terms of treatment results, the changes in patients' psychological state were emphasized, and the changes in patients' clinical indicators were simply described, which will be corrected by strengthening laboratory examination in the next step.

Disclosure of conflict of interest

None.

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